



[7590-01-P]

NUCLEAR REGULATORY COMMISSION

[Docket No. 50-186; NRC-2013-0090]

University of Missouri-Columbia Research Reactor

AGENCY: Nuclear Regulatory Commission.

ACTION: Environmental assessment and finding of no significant impact; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is considering renewal of Facility Operating License No. R-103, held by the Curators of the University of Missouri (the licensee) for the continued operation of its University of Missouri-Columbia Research Reactor (MURR or the reactor). The NRC is issuing an environmental assessment (EA) and finding of no significant impact (FONSI) associated with the renewal of the license.

DATES: The EA and FONSI are available on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Please refer to Docket ID NRC-2013-0090 when contacting the NRC about the availability of information regarding this document. You may obtain publicly available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID NRC-2013-0090. Address questions about NRC dockets to Carol Gallagher;

telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. For the convenience of the reader, the ADAMS accession numbers are provided in a table in the "Availability of Documents" section of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Geoffrey A. Wertz, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-0893; e-mail: Geoffrey.Wertz@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Introduction

The NRC is considering renewal of Facility Operating License No. R-103, held by the Curators of the University of Missouri, which would authorize continued operation of its reactor

for 20 years from date of issuance, located in the University Research Park, Columbia, Boone County, Missouri. As required by section 51.21 of title 10 of the *Code of Federal Regulations* (10 CFR), "Criteria for and identification of licensing and regulatory actions requiring environmental assessments," the NRC staff prepared an EA documenting its environmental review. Based on the results of the EA that follows, the NRC has determined not to prepare an environmental impact statement for the proposed renewed license is not required and is issuing a FONSI in accordance with 10 CFR 51.32.

II. Environmental Assessment

Facility Site and Environs

The MURR facility is located on 7.5 acres of land in the central portion of the 84-acre University Research Park in Boone County. Boone County is located in the central part of the state and consists of an area of approximately 683 square miles (1,769 square km) and is approximately 41 miles (66 km) in its greatest north-to-south length and 22 miles (35.4 km) in its greatest east-to-west width. The University Research Park is an extension of the University of Missouri-Columbia, main campus and is located approximately 1.6 kilometers (1 mile) southwest of the main campus. The MURR facility includes a five-story reactor containment building which is centrally located and integrated into a one-story laboratory building. Immediately surrounding the MURR facility are other research buildings and parking lots associated with the University Research Park. Facilities beyond the University Research Park include a golf course to the west; campus sports arenas and fields to the northeast, east, and south; and the University's main campus. The City of Columbia is to the north. There are few permanent residences nearby with only 225 persons living within 1 kilometer (0.6 miles) of the

MURR facility. The nearest permanent residence is located approximately 760 meters (0.5 miles) north of the site. The nearest dormitories are located approximately 1 kilometer (0.6 miles) from the MURR facility. The MURR is a tank-type (pressure vessel) reactor where the tank is located in an open pool. The reactor is light water moderated and cooled. It is licensed to operate at a maximum thermal steady state power level of 10 megawatts (MWt). The reactor core is located in a pressure vessel within the lined reactor pool. The reactor pool is 3 meters (10 feet) in diameter and 9 meters (30 feet) deep. The reactor is fueled with highly-enriched uranium plate-type fuel contained in eight fuel elements. A detailed description of the reactor can be found in the MURR safety analysis report (SAR). There have been no major modifications to the MURR since issuance of Operating License Amendment No. 2 on July 9, 1974, which authorized the MURR to operate at its current power level. However, the facility has added several laboratories and hot cells over the intervening time period in order to conduct research activities. A complete description of these changes will be provided in the NRC staff's safety evaluation report (SER) accompanying the issuance of the renewed license.

Description of the Proposed Action

The proposed action would renew Facility Operating License No. R-103 for an additional 20 years from the date of issuance of the renewal license. The proposed action is in accordance with the licensee's application dated August 31, 2006, as supplemented by letters dated January 15, January 29, May 18, July 2, July 16, August 31, September 3, September 30, October 29, and November 30, 2010; March 11 and September 8, 2011; January 6 and June 28, 2012; January 28, July 31, and October 1, 2015; and February 8, April 8, April 15, May 31, and July 25, 2016 (the renewal application). In accordance with 10 CFR 2.109, "Effect

of timely renewal application,” the existing license remains in effect until the NRC takes final action on the renewal application.

Need for the Proposed Action

The proposed action is needed to allow the continued operation of the reactor to routinely provide training, research, and services to the research community and the commercial sector for a period of 20 years.

Environmental Impacts of the Proposed Action

Radiological Impacts

Gaseous radioactive effluents are discharged through a multi-stage filtration system to the facility ventilation exhaust stack during reactor operations. The stack height is 21 meters (70 feet) above grade level; however, the effective stack height is greater due to the stack exhaust volumetric flow rate of 864 cubic meters per minute (30,500 cubic feet per minute). Other parts of the MURR facility are maintained at a negative pressure with respect to the reactor exhaust system which helps ensure that any release pathways are through the facility ventilation exhaust stack that provides an elevated release point for dispersion of the effluent. The licensee indicated that the most significant radionuclide released from reactor operation into the gaseous effluent stream is Argon-41 (Ar-41), which accounts for greater than 99 percent of the radioactivity released. The licensee measures the quantity of Ar-41 released annually from the facility ventilation exhaust stack under normal reactor steady-state operating conditions and provides the results in their annual reports. The licensee also provided calculations, using the maximum annual Ar-41 radioactivity release allowed by Technical Specification (TS) 3.7, “Radiation Monitoring Systems and Airborne Effluents,” which results in a maximum potential

dose to a member of the public of 0.0235 milliSieverts (mSv) (2.35 mrem), which occurs at the nearest residence: a location which is 760 meters (2493 feet) from the licensee's release point (elevated stack). The NRC staff performed independent calculations to verify that the licensee's calculated public dose from Ar-41 represented a conservative estimate. The NRC staff calculated a maximum public dose from Ar-41 of 0.0415 mSv (4.15 mrem).

A review of the licensee's annual reports for the 5 years of operation from 2010 through 2015 shows that Ar-41 constitutes the significant radioactive isotope released from the MURR facility. The maximum annual release of Ar-41 was approximately 78 percent of the TS 3.7 limit in 2013, and the average Ar-41 release was approximately 70 percent of the TS 3.7 limit over the period from 2010 through 2015.

The licensee also considered the radiological effect of nitrogen-16 (N-16), which is produced from neutron activation of oxygen-16 in the reactor primary cooling system and pool coolant water. N-16 decays with a very short half-life of 7 seconds. Because the primary cooling system is a closed system that is shielded or located in areas with restricted access to the MURR staff during reactor operation, radiation exposure from or release of N-16 are not concerns. The MURR has hold-up tanks in both the primary coolant demineralizer loop and the pool coolant system, which allows the majority of N-16 in these systems to decay. The hold-up tanks are located in an area designated as a high radiation area which has locked, restricted access. Therefore, most of the N-16 has been removed through decay prior to reaching the pool surface or in areas where the MURR staff requires access. Other radioactive gaseous effluents released, as reported in the licensee's annual reports were approximately 1 percent or less of the air effluent concentration limits set by 10 CFR part 20, appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational

Exposure; Effluent Concentrations; Concentrations for Release to Sewerage,” Table 2, “Effluent Concentrations,” Column 1, “Air.”

Since the potential annual radiation dose resulting from the maximum effluent release from the normal operation of the MURR to a member of the public in the unrestricted area at the nearest residence is 2.35 mrem (0.0235 mSv) to 4.15 mrem (0.0415 mSv), the licensee demonstrates compliance with the dose limit of 100 mrem (1 mSv) set by 10 CFR 20.1301, “Dose limits for individual members of the public.” Additionally, this potential radiation dose also demonstrates compliance with the “as low as is reasonably achievable” (ALARA) air emissions dose constraint of 10 mrem (0.1 mSv) specified in 10 CFR 20.1101, “Radiation protection programs,” paragraph (d). The NRC staff reviewed the radiological dose calculations provided by the licensee, the assumptions used, and the results of several years of effluent releases from the licensee’s annual reports, as well as toured the facility, and finds the results of the licensee’s dose estimates to be reasonable.

The licensee directs all potentially radioactive liquid waste into a liquid waste retention system until the liquid waste can be assayed for radioactive content, and chemically treated, if necessary, for disposal by discharge to the sanitary sewer system. Discharge of any liquid waste to the sanitary sewer requires the use of the MURR procedures to ensure that the liquid discharge meets the requirements of 10 CFR 20.2003, “Disposal by release into sanitary sewerage,” prior to release into the sanitary sewer. A review of the licensee’s disposal data from its annual reports over the years 2010 through 2015, indicates that tritium constitutes more than 90 percent of the total activity released to the sanitary sewer, and all radioactive liquid releases were well below 10 percent of the regulatory limits in 10 CFR part 20, appendix B.

The MURR Health Physics Group oversees the handling of solid low-level radioactive waste generated at the MURR facility. This waste consists mainly of contaminated items such

as demineralizer resins, filters, plastic bags, gloves, absorbent material, and wipes, as well as reactor equipment or components that are no longer of use. The MURR Health Physics Group disposes of the waste by shipment to a low level waste broker, or directly to a waste processing site for final disposal, in accordance with all applicable regulations for transportation of radioactive materials.

The licensee transfers mixed waste, consisting of substances having both hazardous and radioactive materials, to the Missouri University Environmental Health and Safety Department for disposal. If the mixed waste contains only short-lived radioactive materials, it may be stored until the short-lived materials decay to background levels and is then disposed of as hazardous waste. Mixed waste with long-lived radioactive material is transferred to an authorized facility for disposal.

To comply with the Nuclear Waste Policy Act of 1982, the licensee has entered into a contract with the U.S. Department of Energy (DOE) that provides that DOE retains title to the fuel utilized at the MURR and that DOE is obligated to take the fuel from the site for final disposition. Spent nuclear fuel is shipped regularly from the site to the DOE following a period of time, which allows for the decay of short-lived radioisotopes and lowers the temperature of the spent fuel, in accordance with the MURR procedures and the applicable regulations for transportation of radioactive materials. No changes during the license renewal period are expected in the procedures for shipment of spent fuel that would affect the environment.

The MURR is cooled by three coolant systems: primary, pool, and secondary. Natural convection can be used to cool the reactor core up to a license limit power of 50 kilowatts thermal (kWt), and forced circulation is required for higher power levels up to the license limit of 10 MWt. Above 50 kWt, the reactor core is cooled by the primary cooling system which circulates pressurized primary coolant through the reactor pressure vessel and then through the

primary coolant heat exchangers, which transfer the heat to the secondary cooling system. The reactor pool, which contains the reactor pressure vessel and other reactor systems, is cooled by the pool cooling system which circulates the flow of pool coolant through the pool coolant heat exchanger and transfers the heat to the secondary cooling system. The heat from the primary and pool coolant systems is transferred to the secondary coolant system which dissipates the heat to the atmosphere from a mechanical cooling tower. The temperature control of the primary and pool cooling systems is maintained by an automatic temperature control system which adjusts secondary coolant flow to support the desired heat transfer and coolant temperature. The primary coolant is monitored for fission product activity by the Fuel Element Failure Monitoring System, which provides a continuous indication of the primary coolant radioactivity to the control room operators. The Secondary Coolant Monitoring System continuously monitors the secondary coolant for radioactivity which could indicate a leak from the primary or pool coolant heat exchangers. Continuously monitoring both cooling systems for radioactivity helps to ensure that the potential for any radioactivity to leak into the secondary cooling system, and environment, are minimized. The licensee also conducts periodic tests of the coolant systems to further reduce the likelihood of secondary system contamination.

As described in Chapter 11 of the MURR SAR, personnel exposures are well within the limits set by 10 CFR 20.1201, "Occupational dose limits for adults," and the ALARA dose criteria in 10 CFR 20.1101, paragraph (b). The MURR Health Physics Group tracks personnel exposures, which are usually less than 5.0 milliSieverts (500 millirem) per year. The MURR ALARA program requires the Health Physics Group to investigate any personnel exposure that exceed 0.3 milliSieverts (30 millirem) in a month, which is less than 1 percent of the annual limit of 50 milliSieverts (5,000 millirem) specified in 10 CFR 20.1201. Environmental dosimeters mounted in several locations in and around the MURR facility provide a quarterly measurement

of total radiation exposures at those locations. These dosimeters typically measure annual doses of less than 0.3 milliSieverts (30 millirem), except in the area of the loading dock, where packages containing radioactive materials in transit may be stored for short periods of time. In this location, the environmental dosimeters measure annual doses typically less than 1.0 milliSievert (100 millirem). The proposed action does not authorize any changes in the design or operation of the facility that would alter these occupational dose levels. There is no significant increase in individual or cumulative occupational radiation exposure as a result of license renewal.

The licensee conducts an environmental monitoring program to record and track the radiological impact of the MURR operation on the surrounding unrestricted area. The program consists of soil and vegetation collected semi-annually from eight locations; water samples collected semi-annually from three locations; and quarterly radiation exposure measurements at 45 locations of varying distances and directions from the MURR facility and at two control locations away from any direct influence from the reactor. The MURR Health Physics Group administers the program and maintains the appropriate records. Based on a review of the licensee's annual reports over the years from 2010 through 2015, the survey program indicated that radioactivity and radiation levels at the monitoring locations were not significantly higher than those measured prior to the start of activities at the MURR facility. Year-to-year trends in radioactivity and radiation levels are consistent between monitoring locations. Also, no correlation exists between total annual reactor operation and annual radioactivity and radiation levels measured at the monitoring locations. Based on the NRC staff's review of data from the annual reports over the years from 2010 through 2015, the NRC staff concludes that operation of the MURR does not have any significant radiological impact on the surrounding environment.

No changes in reactor operation that would affect off-site radiation levels are proposed as part of the license renewal.

Because occupational and public exposures are below regulatory limits, the NRC staff concludes that the proposed action would not have a significant radiological impact.

Accident scenarios are provided in the guidance in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996, and the results of the licensee's analysis was provided in Chapter 13 of the MURR SAR. The most significant radiological fission product release accident at a research reactor is considered as the maximum hypothetical accident (MHA), which for the MURR is the failure of a fueled experiment during irradiation. The MHA scenario involves the irradiation of a 5-gram low-enriched uranium target, for approximately 150 hours, producing approximately 150 Curies of Iodine-131 through Iodine-135, as well as other radioactive isotopes. The scenario assumes that 100 percent of the activity of the sample is released into the reactor pool water; 100 percent of the noble gases in the pool rise to the surface, and becomes airborne, and 0.1 percent of the radioiodine in the pool also becomes airborne via pool water evaporation. The containment ventilation system isolates on actuation of the pool surface radiation monitors, and the radiation workers evacuate the reactor containment within 5 minutes. The licensee conservatively calculated doses to facility personnel during evacuation and the maximum potential doses to members of the public at various locations around the MURR facility. The license estimated an occupational dose of 1,180 mrem (11.80 mSv), for a five minute (evacuation) duration, and 0.0112 mrem (0.00012 mSv) for the maximum exposed member of the public. The NRC staff performed independent calculations to verify that the licensee's calculated doses represented conservative estimates for the MHA. The NRC staff, using conservative assumptions, estimated a dose to a worker of 2,001 mrem (20.01 mSv) for a five

minute duration, and 66 mrem (0.66 mSv) for the maximum exposed member of the public. The details of these calculations are provided in the NRC staff's SER that the NRC staff is preparing to document its safety review of the application for a renewed license. The occupational radiation doses resulting from the postulated MHA would be well below the 10 CFR 20.1201 limit of 5,000 mrem (50 mSv). The maximum calculated radiation doses for members of the public resulting from the postulated MHA would be below the 10 CFR 20.1301 limit of 100 mrem (1 mSv).

Because the licensee has not requested any changes to the facility design or operating conditions as part of its application for license renewal, the proposed action will not significantly increase the probability or consequences of accidents and there will be no significant changes in the type or significant increase in the effluents that may be release off site. The licensee has systems in place for controlling the release of radiological effluents and implements a radiation protection program to monitor personnel exposures and releases of radioactive effluents. The systems and radiation protection program are appropriate for the types and quantities of effluents expected to be generated by continued operation of the reactor. In addition, the NRC staff evaluated information contained in the licensee's renewal application, and data the licensee reported to the NRC for the last 5 years of operation to determine the projected radiological impact of the facility on the environment during the period of the renewed license. The NRC staff found that releases of radioactive material and personnel exposures have been well within applicable regulatory limits.

Based on its evaluation, the NRC staff concludes that continued operation of the reactor would not have a significant radiological impact.

Non-Radiological Impacts

As discussed above, the MURR is cooled by three coolant systems: primary, pool, and secondary. The MURR facility uses approximately 38 million gallons of water per year (or 72 gallons per minute), the majority of which is used to provide make-up water for the secondary system (50 gallons per minute). The source of this water is the University of Missouri Columbia raw water supply system, which draws water from 5 deep wells, and which can provide up to 4,700 gallons per minute. Therefore, the water usage needed to replenish the secondary coolant lost due to evaporation from the MURR facility cooling tower would not impact the University of Missouri Columbia raw water supply, which has excess capacity. Release of thermal effluents from the MURR cooling tower will not have a significant effect on the environment. Chemicals are used in the treatment of secondary coolant and liquid radioactive waste. Sulfuric acid is used to control the potential of Hydrogen (pH) of the secondary coolant, and other chemicals are added to control water hardness and microbiological growth. Chemical treatment of liquid radioactive waste is used to precipitate radionuclides for removal as solids, or to adjust the pH level for disposal. Other chemicals are routinely used in the performance of experiments, which are evaluated and controlled by procedure. Given that the proposed action does not involve any change in the operation of the reactor or change in the emissions or heat load dissipated to the environment, the proposed action would not have a significant impact on land use, visual resources, air quality, noise, non-radiological wastes, or terrestrial or aquatic resources. Additionally, because the MURR does not discharge cooling water directly to the environment, the proposed action would have no effect on surface waters. Furthermore, in preparation for replacement of the secondary coolant cooling towers in 2012, the licensee sampled the cooling tower sump sludge for radioactivity and found none. The MURR's continued use of 38 million gallons of groundwater per year from wells owned and maintained by the University of Missouri-Columbia represents a negligible

portion of water compared to that used by the University as a whole. The proposed action would result in no groundwater conflicts, degradation of groundwater, or other significant impacts to groundwater resources.

Based on its evaluation, the NRC staff concludes that the proposed action would have no significant non-radiological impacts.

Other Applicable Environmental Laws

In addition to the National Environmental Policy Act, the NRC has responsibilities that are derived from other environmental laws, including the Endangered Species Act, Coastal Zone Management Act, National Historic Preservation Act, Fish and Wildlife Coordination Act, and the Executive Order 12898 - Environmental Justice. The following is a brief discussion of impacts associated with these laws and other requirements.

1. Endangered Species Act (ESA)

The ESA was enacted to prevent further decline of endangered and threatened species and restore those species and their critical habitat. Section 7 of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife's (FWS) or National Marine Fisheries Service regarding actions that may affect listed species or designated critical habitats.

The NRC staff conducted a search of Federally listed species and critical habitats that have the potential to occur in the vicinity of the MURR using the FWS Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) system. The IPaC system report identified four Federally endangered or threatened species that may occur or could potentially be affected by the proposed action (ADAMS Accession No. ML16190A040). However, none of these species are likely to occur near the MURR because the facility is located within the University Research Park, an 84-acre developed area

used for research and academic purposes. The MURR was constructed in the 1960s and has remained in use since that time. University Research Park is bordered by a golf course, athletic fields, other academic and office buildings associated with the University of Missouri-Columbia, and residential properties. Accordingly, the area does not provide suitable habitat for any Federally listed species. Further, the IPaC report determined that no critical habitat is within the vicinity of the MURR. Accordingly, the NRC concludes that the proposed license renewal of the MURR would have no effect on Federally listed species or critical habitats. Federal agencies are not required to consult with the FWS if the agencies determine that an action will not affect listed species or critical habitats (ADAMS Accession No. ML16120A505). Thus, the ESA does not require consultation for the proposed the MURR license renewal, and the NRC considers its obligations under ESA Section 7 to be fulfilled for the proposed action.

2. Coastal Zone Management Act (CZMA)

The CZMA, in part, encourages States to preserve, protect, develop, and where possible, restore or enhance, resources. Applicants for Federal licenses to conduct an activity that affects any land or water use or natural resource of the coastal zone of a state must provide a certification in that the proposed activities complies with the State's approved coastal zone management program and will conduct activities consistent with that program.

The State of Missouri does not contain any coastal zones. Because the MURR is not located within or near any managed coastal zones, the proposed action would not affect any coastal zones. Therefore, the NRC finds that the licensee does not need to provide a certification under the CZMA.

3. National Historic Preservation Act (NHPA)

The NHPA requires Federal agencies to consider the effects of their undertakings on historic properties. As stated in the Act, historic properties or resources are any prehistoric or

historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP). The NRHP lists one historical site located on the University of Missouri campus. The site is the East Campus Neighborhood Historic District. The location of the East Campus Neighborhood Historic District is approximately 4 kilometers (2.4 miles) northeast of the MURR facility. The closest off-campus historical site is the Sanborn Field and Soil Erosion Plots located 2 kilometers (1.2 miles) northeast of the MURR facility. Given the distance between the MURR facility and the Sanborn Field and Soil Erosion Plots, continued operation of the MURR will not impact any historical sites. Based on this information, the NRC finds that the potential impacts of license renewal would have no adverse effect on historic and archaeological resources.

4. Fish and Wildlife Coordination Act

The FWCA requires Federal agencies that license water resource development projects to consult with the FWS (or NMFS, when applicable) and State wildlife resource agencies regarding the potential impacts of the project on fish and wildlife resources.

The licensee is not planning any water resource development projects, including any modifications relating to impounding a body of water, damming, diverting a stream or river, deepening a channel, irrigation, or altering a body of water for navigation or drainage. Therefore, no coordination with other agencies pursuant to the FWCA is required for the proposed action.

5. Executive Order 12898 – Environmental Justice

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” 59 FR 7629 (February 16, 1994), directs agencies to identify and address the disproportionately high and adverse human health or environmental

effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law.

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the relicensing and the continued operation of the MURR. Such effects may include human health, biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the MURR, and all are exposed to the same health and environmental effects generated from activities at the MURR.

Minority Populations in the Vicinity of the MURR – According to the 2010 Census, approximately 22 percent of the population (total of approximately 138,000 individuals) residing within a 10-mile radius of MURR identified themselves as a minority. The largest minority populations were Black or African American (approximately 15,000 persons or 11 percent) and Asian (approximately 4,600 persons or 3.3 percent). According to the 2010 Census, about 19 percent of the Boone County population identified themselves as minorities, with Black or African Americans and Asians comprising the largest minority populations (9.3 and 3.8 percent, respectively). According to the U.S. Census Bureau's 2015 American Community Survey 1-Year Estimates, the minority population of Boone County, as a percent of the total population, had increased to about 21 percent with Black or African Americans and Asians origin comprising the largest minority populations (9 and 4 percent, respectively).

Low-income Populations in the Vicinity of the MURR – According to the U.S. Census Bureau's 2010-2014 American Community Survey 5-Year Estimates, approximately 29,600 individuals (22.2 percent) residing within a 10-mile radius of the MURR were identified as living

below the Federal poverty threshold. The 2014 Federal poverty threshold was \$24,230 for a family of four.

According to the U.S. Census Bureau's 2015 American Community Survey 1-Year Estimates, the median household income for Missouri was \$50,238, while 14.8 percent of the state population and 10.2 percent of families were found to be living below the Federal poverty threshold. Boone County had a slightly higher median household income average (\$50,520) and a higher percentage of persons (18.5 percent) and lower percentage of families (6.9 percent) living below the poverty level, respectively.

Impact Analysis – Potential impacts to minority and low-income populations would consist of radiological effects; however, radiation doses from continued operations associated with this license renewal are expected to continue at current levels, and would be well below regulatory limits. Because the proposed action involves no construction or land disturbance, no additional visual or noise impacts are expected to result from the proposed action.

Based on this information and the analysis of human health and environmental impacts presented in this EA, the proposed action would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of the MURR.

Environmental Impacts of the Alternatives to the Proposed Action

As an alternative to license renewal, the NRC considered denial of the proposed action (i.e., the “no-action” alternative). If the NRC denied the request for license renewal, reactor operations would cease and decommissioning would be required (sooner than if a renewed license were issued) and the environmental effects of decommissioning would occur. Decommissioning would be conducted in accordance with an NRC-approved decommissioning

plan, which would require a separate environmental review under 10 CFR 51.21. Cessation of facility operations would reduce or eliminate radioactive effluents and emissions associated with operations. However, as previously discussed in this EA, radioactive effluents and emissions from reactor operations constitute a small fraction of the applicable regulatory limits. Therefore, the environmental impacts of license renewal and the denial of the request for license renewal would be similar. In addition, denying the request for license renewal would eliminate the benefits of teaching, research, and services provided by the MURR.

Alternative Use of Resources

The proposed action does not involve the use of any different resources or significant quantities of resources beyond those previously considered in the issuance of Amendment No. 2 to Facility Operating License No. R-103 for the MURR dated July 9, 1974, which authorized the MURR to operate at a maximum steady-state power level of 10 MWt.

Agencies and Persons Consulted

In accordance with NRC policy, the staff consulted with the Missouri State Liaison Officer on October 28, 2016, regarding the environmental impact of the proposed action, explained the environmental reviews and forwarded a draft of this environmental assessment. On November 16, 2016, the Missouri State Liaison Officer indicated, by electronic mail, that the State understood the NRC review and had no comments regarding the proposed action (ADAMS Accession No. ML16321A511).

The NRC staff also consulted with the State of Missouri, Department of Natural Resources, State Historic Preservation Office (Missouri SHPO) pursuant to Section 106 of the National Historic Preservation Act by letter dated June 17, 2010 (ADAMS Accession No.

ML101730044). The Missouri SHPO responded by letter dated July 2, 2010 (ADAMS Accession No. ML101950104). The Missouri SHPO informed the NRC that the MURR in Columbia is eligible for inclusion in the National Register of Historic Places. However, the SHPO stated that because the proposed license renewal would not involve any new construction, excavation, demolition or rehabilitation, the action should have no adverse effect.

III. Finding of No Significant Impact.

The NRC is considering issuance of a renewed Facility Operating License No. R-103, held by the Curators of the University of Missouri for the continued operation of the MURR for an additional 20 years.

On the basis of the EA included in Section II of this notice and incorporated by reference in this finding, the NRC staff finds that the proposed action will not have a significant impact on the quality of the human environment. The NRC staff's evaluation considered information provided in the licensee's application, as supplemented, and the NRC staff's review of related environmental documents. Section IV below lists the environmental documents related to the proposed action and includes information on the availability of these documents. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

IV. Availability of Documents.

The following table identifies the environmental and other documents cited in this document and related to the NRC's FONSI. These documents are available for public

inspection online through ADAMS at <http://www.nrc.gov/reading-rm/adams.html> or in person at the NRC's PDR as described previously.

DOCUMENT	ADAMS Accession No.
Application for License Renewal for the University of Missouri-Columbia Research Reactor as Per 10 CFR 2.109 – Cover Letter, August 31, 2006	ML062540114
Safety Analysis Report for the University of Missouri-Columbia Application for License Renewal, Volume 1 of 2 – August 31, 2006 (redacted version)	ML092110573
Safety Analysis Report for the University of Missouri-Columbia Application for License Renewal, Chapters 10-18, Volume 2 of 2, August 31, 2006 (redacted version)	ML092110597
University of Missouri Research Reactor (MURR) Environmental Report for License Renewal, August 31, 2006	ML062540121
Transmittal of University of Missouri-Columbia Research Reactor's Responses to the NRC Request for Additional Information Regarding Renewal for Amendment Facility Operating License, January 15, 2010	ML100220371
Written Communication as Specified by 10 CFR 50.4(b)(1) Regarding the Response to the University of Missouri at Columbia – Request for Additional Information RE: License Renewal Environmental Report, January 29, 2010	ML100330073
University of Missouri-Columbia Research Reactor's Response to NRC RAI dated April 20, 2010, May 18, 2010	ML101440148
MO, Dept. of Natural Resources, Review of University of Missouri, Columbia Research Reactor, 1513 Research Park Drive is Eligible for Inclusion in the National Register of Historic Places and Determination of Proposed License Renewal have no adverse Effect, July 2, 2010	ML101950104
University of Missouri, Columbia, Response to NRC Request for Additional Information, dated June 1, 2010, July 16, 2010 (redacted version)	ML12354A237
University of Missouri, Columbia, Licensee Response to NRC Request for Additional Information - Chapter 10, August 31, 2010 (redacted version)	ML120050315
University of Missouri, Columbia, Response to Request for Additional Information Regarding License Renewal, September 3, 2010	ML102500533
University of Missouri, Columbia, Response to Request for Additional Information Regarding License Renewal, September 30, 2010	ML12355A019
University of Missouri, Columbia Response to NRC Request for Additional Information 45-Day Response Questions, October 29, 2010 (redacted version)	ML12355A023
Written Communication as Specified by 10 CFR 50.4 (b)(1) Regarding the Response to the University of Missouri at Columbia – Request for Additional Information RE: License Renewal, Safety Analysis Report, Complex Questions, dated May 6, 2010, October 29, 2010	ML103060018
University of Missouri, Columbia - Response to NRC Request for Additional Information 45-Day Response Questions, (TAC No. ME1580) November 30, 2010 (redacted version)	ML12355A026

University of Missouri-Columbia Research Reactor Response to Request for Additional Information Regarding Renewal Request for Amendment Facility Operating License R-103, March 11, 2011	ML110740249
University of Missouri-Columbia Research Reactor's Response to NRC Request for Additional Information Regarding Renewal Request for Amended Facility Operating License R-103, September 8, 2011	ML11255A003
University of Missouri – Columbia, Written Communication as Specified by 10 CFR 50.4 (b)(1) Regarding Responses to the University of Missouri at Columbia – Request for Additional Information RE: License Renewal, Safety Analysis Report, January 6, 2012	ML12010A186
University of Missouri, Columbia - Licensee Response to NRC Request for Additional Information dated May 6, 2010 (Complex Questions) and June 1, 2012 (45-Day Response Questions) RE: License Renewal, June 28, 2012 (redacted version)	ML12346A004
Written Communication as Specified by 10 CFR 50.4(b)(1) Regarding the Response to the University of Missouri at Columbia – Request for Additional Information Regarding the Renewal of Facility Operating License No. R-103 for the University of Missouri, January 28, 2015	ML15034A474
University of Missouri-Columbia – Response to Request for Additional Information Regarding Renewal Request for Amended Facility Operating License, July 31, 2015	ML15216A122
University of Missouri, Columbia-Responses to NRC Request for Additional Information, Dated April 17, 2015, Regarding Renewal Request for Amended Facility Operating License, October 1, 2015	ML15275A314
University of Missouri-Columbia – Response to NRC Request for Additional Information dated December 18, 2015, Regarding Renewal Request for License No. R-103, February 8, 2016	ML16041A221
University of Missouri at Columbia – Responses to NRC Request for Additional Information dated February 8, 2016, Regarding Renewal Request (Financial Review), April 8, 2016	ML16103A536
University of Missouri- Columbia Research Reactor, Response to Request for Additional Information on License Renewal, April 15, 2016	ML16110A164
University of Missouri-Columbia Research Reactor's Responses to the NRC Request for Additional Information dated October 28, 2015, Regarding Our Renewal Request for Amended Facility Operating License No. R-103, May 31, 2016	ML16155A132
U.S. Fish and Wildlife Service, University of Missouri-Columbia Research Reactor Proposed License Renewal, IPaC Trust Resources Report, July 8, 2016	ML16190A040

U.S. Fish and Wildlife Service, Endangered Species Consultations Frequently Asked Questions, July 15, 2013	ML16120A505
University of Missouri-Columbia Research Reactor's Responses to the NRC Request for Additional Information Regarding the Proposed Technical Specifications for License Renewal, July 25, 2016	ML16209A236

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For the Nuclear Regulatory Commission.

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